WHAT IS CLAIMED IS:

1. A PIN photodiode comprising:

a first conductive-type semiconductor substrate;

an intrinsic semiconductor layer and a second conductive-type semiconductor layer formed on the first conductive-type semiconductor substrate in sequence;

a first insulation layer formed on the second conductive-type semiconductor layer, in which a window is formed in the center part of the first insulation layer so that the intrinsic semiconductor layer is exposed;

a second-conductive type active layer formed on the intrinsic semiconductor layer within the window;

a first electrode formed on the first insulation layer in contact with the second conductive-type active layer; and,

a gate electrode structure consisting of a second insulation layer and a second electrode formed on the second conductive-type semiconductor layer and for applying an electric voltage of a second polarity, so that the lateral extension of the active layer is controlled at the time when an electric voltage of a first polarity is applied to the first electrode formed on the first insulation layer.

2. The PIN photodiode according to claim 1, further comprising an anti-reflection layer formed on the active layer within the window.

3. The PIN photodiode according to claim 1, wherein the first insulation layer is formed to such a thickness that the first electrode and the second electrode are electrically isolated from each other without being overlapped between the crossed portions of the first electrode and the second electrode.

4. The PIN photodiode according to claim 1, wherein the second insulation layer is formed to such a thickness that it can effectively transfer the electric field applied to the second electrode to the active layer.

5. The PIN photodiode according to claim 1, wherein the second conductive-type active layer is a P+ active layer.

6. The PIN photodiode according to claim 1, wherein the electric voltage of the first polarity is negative voltage.

7. The PIN photodiode according to claim 1, wherein the electric voltage of the second polarity is positive voltage.

8. The PIN photodiode according to claim 1, wherein the thickness of the first insulation is substantially greater than the second electrode.